



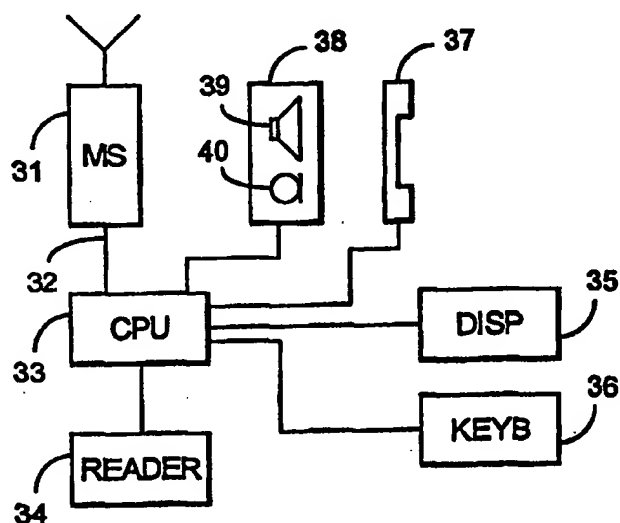
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : H04Q 7/22		A1	(11) International Publication Number: WO 96/42175
			(43) International Publication Date: 27 December 1996 (27.12.96)
(21) International Application Number: PCT/FI96/00321 (22) International Filing Date: 31 May 1996 (31.05.96) (30) Priority Data: 952906 13 June 1995 (13.06.95) FI (71) Applicant (for all designated States except US): NE-PRODUCTS OY [FI/FI]; Teknologiantie 18, FIN-90570 Oulu (FI). (72) Inventor; and (75) Inventor/Applicant (for US only): SAVOLAINEN, Kimmo [FI/FI]; Telkkäkuja 2, FIN-86100 Pyhäjoki (FI). (74) Agent: TEKNOPOLIS KOLSTER OY; Oy Kolster Ab, Iso Roobertinkatu 23, P.O. Box 148, FIN-00121 Helsinki (FI).			(81) Designated States: AL, AM, AT, AU, AZ, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). Published With international search report.

(54) Title: METHOD AND TERMINAL EQUIPMENT FOR TRANSMITTING INFORMATION NOT RELATING TO A CALL

(57) Abstract

The invention relates to a terminal equipment and to a method for transmitting information not relating to a call to a telephone user in a cellular radio system comprising a number of terminal equipments (20a-20c) and base stations (22a-22c) communicating over a radio path, in which method information not relating to the calls is sent from the system to the terminal equipments (20a-20c) which display the information in a display unit (35). For conveying versatile information effectively to a terminal equipment user, the display unit (35) of the terminal equipment is controlled in such a way that the display unit (35) displays alternately call-related information and information not relating to the calls.



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Method and terminal equipment for transmitting
information not relating to a call

The present invention relates to a method for
5 transmitting information not relating to a call to a
telephone user in a cellular radio system comprising a
number of terminal equipments and base stations com-
municating over a radio path, in which method informa-
tion not relating to the calls is sent from the system
10 to the terminal equipments which display the information
in a display unit.

The invention also relates to a terminal equip-
ment in a cellular radio system, comprising a cellular
radio transceiver, a display unit, and means for receiv-
15 ing from the cellular radio system textual information
intended for the user and not relating to the calls to
be forwarded.

Conventional terminal equipments intended for
speech transmission that are used in cellular radio sys-
20 tems today have a display unit as well, through which
various types of information relating to calls and call
establishment can be conveyed to the user. Typically the
display unit displays for example the field strength of
the signal received by the terminal equipment from the
25 base station, the telephone number of the other sub-
scriber, and the duration of the call.

It is also possible to convey other text
information in the form of 'short messages' in digital
cellular radio systems. In such a case, the display unit
30 of the terminal equipment that received the short mess-
age displays a brief message typically having a length
of a few words. The length of the message is limited by
the size of the display unit, which is very small in
typical terminal equipments. Short messages are one-time
35 user-to-user type messages, which are read once and

deleted from the memory of the terminal equipment. The implementation of short messages is described in detail in GSM specification TS GSM 03.40, which is incorporated herein by reference.

5 Solutions in accordance with the prior art are intended for user-to-user communication in which the delivered message can be discarded after reading. The prior art solutions are rather poorly suited to conveying long-term information.

10 It is an object of the present invention to enable conveying of various kinds of information to one or more terminal equipments simultaneously as the information necessary for the calls and call establishment is also visible to the user.

15 This object is achieved with a method as set forth in the preamble, which is characterized in that the display unit of the terminal equipment is controlled in such a way that the display unit displays alternately call-related information and information not relating to the calls.

20 The terminal equipment set forth in the preamble is characterized in that it comprises means for controlling the display unit in such a way that the display unit displays alternately call-related information and information not relating to the calls.

25 The method of the invention makes it possible to realize a versatile information service to terminal equipment users. The invention can be applied in any conventional cellular radio system.

30 As cellular radio systems are becoming more common and as their coverage areas are in many places replacing systems implemented with fixed wired telephone connections, it has become necessary to develop pay telephones utilizing cellular telephone systems. A need
35 for such telephones exists for instance in an area where

no fixed wire telephone connections have been constructed, or in applications in which a pay telephone is located in an environment where a connection to a fixed network is not readily available, for instance in moving
5 vehicles. The method of the present invention can be applied with particular advantage in a system in which pay telephones have been implemented with terminal equipment. In that case, information services can be furnished on the display of the terminal equipment when
10 the telephone is in idle mode and also during calls.

Information services may include any information that is of interest to customers, such as information on road traffic congestions in the surroundings of the terminal equipment, information on stock exchange quotations,
15 or advertisements.

The method and the terminal equipment in accordance with the invention can be implemented in any cellular radio system, such as the NMT, AMPS, TACS and GSM. In the terminal equipment of the invention, it is
20 possible to apply the characteristics of the cellular radio systems effectively to the special requirements of a pay telephone. In particular, the above-mentioned information transfer can be realized for instance in the GSM and DCS systems by using 'short messages'. The
25 information can thus be conveyed during a call, and it is not necessary to reserve a separate radio channel for this purpose, but the information can be transmitted by means of signalling during the call.

In the following, the invention will be explained in greater detail with reference to the examples
30 in accordance with the accompanying drawings, in which

Figure 1 is a schematic representation of the configuration of a pay telephone system,

Figure 2 schematically represents an example of
35 the transmission of a super message,

Figure 3 illustrates an example of the construction of a terminal equipment of the invention on block diagram level, and

5 Figure 4 illustrates a possible construction for the control unit by means of a block diagram.

In the following, the invention will be described in detail using as an example the digital GSM mobile telephone system, yet without being restricted thereto. It will be apparent that the terminal equipment
10 of the invention can be implemented with minor modifications in any analog or digital cellular radio system, as stated previously.

In a preferred embodiment of the invention, the terminal equipment displaying extra information is a pay
15 telephone, but the invention may likewise be applied to terminal equipments in normal use.

Figure 1 illustrates the configuration of a pay telephone system to be realized in a cellular radio network. The system comprises a number of pay telephones
20 20a-20c, each communicating with base stations 22a-22b via a radio path 21a-21c. With regard to the radio path and the base station, the terminal equipments serving as pay telephones are no different from conventional subscriber terminal equipment. The base stations 22a-22b
25 typically communicate with base station controllers 24a-24b via transmission links 23a-23b, which can be implemented with an optical cable, copper wireline or radio relay link, and each base station controller controls several base stations. The base station
30 controllers 24a-24b in turn communicate with a mobile exchange 26 via transmission lines 25a-25b, said mobile exchange controlling the operation of the base station controllers and forwarding the calls from the terminal equipments further to a fixed network or to other parts
35 of the cellular radio system through transmission lines

27.

In the exemplary GSM system, the control equipment 30 of the pay telephone system is connected for instance by using an X.25 connection 29 to a short message service centre 28, which in turn communicates with GSM cellular networks and the mobile exchanges thereof. The above description of a cellular radio system thus relates to the GSM system, but it is obvious that even though the construction in other systems differs in its details from that which is described, there are no differences as regards the essential parts of the construction. It should be noted that it is possible to realize a pay telephone system without a short message service centre also in the GSM system by connecting the control equipment 30 of the pay telephone system to the cellular radio system in other known ways, for instance by means of a modem.

In a preferred embodiment of the invention, the control and management of the information to be displayed to the customer, i.e. to the user of the terminal equipment, are incorporated in the pay telephone control equipment 30. The same information may be transmitted to one or several terminal equipments controlled by the control equipment.

In a preferred embodiment of the invention, the information to be displayed to the customer, i.e. to the user of the terminal equipment, is delivered to the terminal equipment in the form of short messages. The communication protocol is based on the use of a super message consisting of one or more short messages. The short message service of the GSM is based on sending separate independent messages. In the solution in accordance with the invention, a sequence number is attached to each message of the super message for the detection of transmission error situations. The recipient of the message

acknowledges the receipt of the message to the sender. The reason for a negative acknowledgement may be reception of an incorrect super message, which is detected on the basis of the sequence numbers or check sums for the messages.

The control equipment 30 of the pay telephone system thus forwards the messages to the short message service centre 28, which handles the relaying of actual short messages to all addressed terminal equipments. In the solution in accordance with a preferred embodiment of the invention, the communication protocol is efficient, because simultaneously as the control equipment 30 sends super messages to the pay telephones, it can receive acknowledgements of short messages sent by the short message service centre 28.

The following is a description of the structure of a super message in accordance with the invention. The super message SprM consists of one or more separate short messages SMi:

$$\text{SprM} = \text{SM0} + \text{SM1} + \dots + \text{SMn}.$$

Each short message SMi has a Short Message System Part SMSi, e.g. information on the sender and recipient. The structure of the Short Message System Part is described in detail in the GSM specification 03.40 referred to above. In addition to the system part, each message comprises a Short Message User Part SMUi that contains the actual message to be sent:

$$\text{SMi} = \text{SMSi} + \text{SMUi}, \text{ where } i = 0 \dots 254.$$

The structure of the Short Message User Part may be illustrated by the formula

$$SMU_i = Id + SM_No + Data + Check_Sum$$

where Id is the identification of the super message, preferably having a length of 1 byte, SM_No is the short message sequence number, preferably having a length of 2 bytes. Data is the information to be sent, having a length of 1 - n bytes, and Check_Sum is a modulo 256 sum of bytes in SMU, having a length of 1 byte.

Figure 2 illustrates an example of a situation in which a super message consisting of three short messages SM0, SM1, SM2 is sent. The pay telephone system control equipment PMS transmits the messages to the short message service centre SM-SC, which acknowledges the received messages and relays them further to the pay telephone PP. The pay telephone PP acknowledges the received messages to the short message service centre SM-SC, and the acknowledgement is also transmitted to the pay telephone system control equipment PMS. The short message service centre sends an indication of the delivery of the acknowledgement to the pay telephone.

Figure 3 illustrates an example of a preferred embodiment of a terminal equipment of the invention. The terminal equipment of the invention comprises a cellular radio transceiver 31 and a control unit 33 connected directly to the transceiver 31 without a two-wire connection. The terminal equipment of the invention also comprises a collecting means 34 connected to the control unit 33. The terminal equipment typically also comprises a dialling means 36 with which a desired telephone number is dialled, display equipment 35, and a receiver 37. The terminal equipment may also comprise means 38 enabling a hands-free facility, comprising a loudspeaker 39, a microphone 40 and the required amplifiers. Some or all of the above components may, if desired, be directly

integrated into the transceiver 31, but they may also be implemented as separate means, even if structurally within the same casing.

5 The purpose of the collecting means 34 is to enable the user to be charged for executing a call in accordance with the current tariff and the characteristics of the call executed. The collecting means 34 can be implemented in a variety of known ways. A typical implementation is to use a call card reading/writing
10 device. The cards used may be for instance disposable cards which contain a certain amount of talk time and which cannot be reloaded. It is also possible to use loadable call cards, various smart cards or credit cards. When credit cards are used, the control unit 33
15 must be capable of checking the credit standing. It is also possible to use 'proximity cards', i.e. cards that are read and written into without any physical contact between the reading device and the card, in the equip-
20 ment. Hence the use of wearing parts in the device is obviated, such parts being included for instance in a magnetic card reading device. In such a case, the equip-
ment may also be implemented without any openings in the exterior, which will reduce the possibility of vandalism.

25 The purpose of the transceiver unit 31 is to establish a radio connection to a base station when required, in order that a call may be forwarded. The unit 31 also handles all procedures relating to the main-
30 tenance of the radio path and the call that are normally the task of a mobile telephone. The unit 31 also receives the short messages transferred by the base station and transmits them to the control unit 33 for processing. Likewise, the unit 31 sends acknowledgements of received short messages to the base station under the
35 control of the control unit 33.

The purpose of the control unit 33 is to control the pay telephone. The control unit typically comprises a microprocessor, fixed and reprogrammable memory circuits, multiplexing means and switches. The control unit
5 controls the operation of the other units of the equipment, keeps a record of the calls executed and handles the charging.

Figure 4 illustrates a possible way of embodying the control unit 33. In the figure, the control unit is
10 connected to the transceiver unit via a bus 32, and the control unit is provided with a bus buffer 41, which can be implemented with separate components. The unit comprises a microprocessor 42, which may be for instance model Intel 80C32 or equivalent. The processor has connected to it detector means 43 detecting whether the
15 performance of the processor program is interrupted owing to an error and restarting the processor when needed. The control unit further comprises memory means 44, into which a program code is stored. The memory
20 means 44 can be implemented for instance with a 'flash memory circuit', which can be updated. The control unit further comprises second memory means 45, into which for instance payment transaction data and received short messages are stored. The second memory means 45 are bat-
25 tery secured. The unit further comprises buffering means 46, 47, of which the buffer 46 serves as a data out buffer, with outgoing lines 48 for controlling the collecting means 34, to audio switches, and for controlling the dialling means 36. The buffering means 47 serve as
30 a data in buffer, with incoming lines connected for instance to the dialling means 36, the receiver 37, and the collecting means 34. Furthermore, there is a connection 50 from the processor 42 to the display means
35.

35 The display equipment 35 used may be for ins-

tance an LCD display, which is capable of displaying numerals, letters, and also graphics if desired. Typical information shown on the display is information relating to the state of the call and to charging.

5 Hence, the control unit 33 receives short messages from the transceiver 31 and typically stores them in the memory means 45. If the short message relates to the information displayed in the display means, the processor 42 controls the display means as called for by
10 the message, when necessary. In the solution in accordance with the invention the display means are thus controlled in such a way that they display to the user alternately the above call-related information, such as
15 call time, call state and charging information, and information not relating to the call, such as road traffic information, weather reports, advertisements, etc. The alternation can preferably be realized in such a way that information of both types is displayed for a fixed
20 period at a time, whereafter a new type of information is changed into the display. The fixed period may be for example 5 seconds.

 The alternation time may also be determined by means of the short message, e.g. incorporating said time in the same short message as the information. The short
25 message may also contain an indication of how long the same information not relating to the call is repeated together with the call-related information, and when new information not relating to the call is substituted for the previous one. Another alternative is to use a fixed
30 value, for example 5 minutes, whereafter the information is changed.

 The control of the display means 35 may be similar irrespective of whether the terminal equipment is actively participating in a call or in idle mode with no
35 ongoing call. When a call is in progress, the extra

information alternates with information relating to the proceeding of the call, and when the equipment is in idle mode, information relating to the field strength or other information facilitating call establishment or the use of the telephone can alternate with the extra information on the display. When the equipment is in idle mode, the display may naturally also be switched off, and the alternation of information may be applied only during a call.

The dialling means 36 can be preferably implemented by utilizing prior art for instance by means of a 5*4 matrix keyboard and a decoder. When a user depresses a key, the state of the depressed key is forwarded to the microprocessor, which reads the code of the depressed key from the decoder. The dialling means 36 may consist of dialling means comprised by the actual transceiver, or dialling means connected to the data bus of the transceiver or to the control unit. The dialling means 36 may be located in the receiver 37 or integrated into the casing structure.

The terminal equipment of the invention preferably comprises means 38 for enabling the hands-free facility. Said means can be implemented by using known components, and they comprise a loudspeaker 39, a microphone 40, and the required amplifiers for producing a sufficient volume level. The hands-free facility may be switched on by means of the dialling means 36, when desired.

A pay telephone must forward information on the payment transactions to the system operator. In the terminal equipment of the invention, payment information can be conveyed preferably during calls, with no need to establish a radio connection separately for data transmission. The terminal equipment of the invention comprises means 31, 33 for transmitting the payment data of

the preceding call executed to the operator equipment 30 controlling the payment transactions during the next call executed at the terminal equipment without the call being disturbed or the caller being aware of the procedure in any way. In the preferred embodiment of the 5 equipment of the invention, this is carried out by utilizing short messages, which for instance in the GSM system can be transmitted as signalling messages during the call.

10 In the GSM system, short messages are forwarded in a centralized manner to a short message service centre, wherefrom they are relayed further to a desired destination, which may be for instance another terminal equipment in some other system. In a preferred embodiment of the invention, the operator equipment is connected to a short message service centre, wherefrom the 15 messages intended for the operator equipment are forwarded to destination. Short messages can be used in all data traffic between a pay telephone and the operator equipment, such as for transmitting call statistics, 20 card blacklist information and credit card queries. The software of the terminal equipment and other parameters controlling the operation of the equipment can also be updated in said manner. Such parameters may include for 25 instance barring of incoming calls or outgoing calls having specified area codes, or other corresponding facilities known from pay telephones.

The terminal equipment of the invention may be of fixed or mobile installation. Fixed installation 30 means that the terminal equipment remains within the area of the same cell in a base station network. Such a terminal equipment may be for instance a pay telephone fixedly installed in a building or a telephone booth. A mobile installation in this context means that the terminal 35 equipment may move from one cell to another in a

base station network. A terminal equipment of this kind may be for instance a vehicle-mounted pay telephone, such as one installed in a taxi or a bus, or a pay telephone installed in a train and moving with the train.

5 Even though the invention has been explained in the above with reference to examples in accordance with the accompanying drawings, it is obvious that the invention is not restricted to them but can be modified in a
10 variety of ways within the scope of the inventive idea disclosed in the appended claims.

base station network. A terminal equipment of this kind may be for instance a vehicle-mounted pay telephone, such as one installed in a taxi or a bus, or a pay telephone installed in a train and moving with the train.

5 Even though the invention has been explained in the above with reference to examples in accordance with the accompanying drawings, it is obvious that the invention is not restricted to them but can be modified in a variety of ways within the scope of the inventive idea.
10 disclosed in the appended claims.

ating to the call alternately displayed in the display unit (35) is changed at given intervals.

6. A terminal equipment as claimed in claim 2, characterized in that the terminal equipment comprises means (33) for controlling the display unit (35) in such a way that the message contained in the received message is displayed to the user in two or more parts, which are displayed in succession at given intervals.

7. A terminal equipment as claimed in claim 2, characterized in that the terminal equipment comprises means (33) for storing several different messages to be displayed, and means (33) for controlling the display unit (35) in such a way that each stored message is displayed to the user in succession at given intervals.

8. A terminal equipment as claimed in claim 1, characterized in that the terminal equipment comprises a control unit (33) controlling charging operations and being directly connected to the cellular radio transceiver, and a collecting means (34) connected to the control unit (33).

9. A terminal equipment as claimed in claim 8, characterized in that the control unit (33) is connected to the cellular transceiver (31) via a bus interface (32).

10. A terminal equipment as claimed in claim 8, characterized in that the terminal equipment comprises means (31, 33) for transmitting the charging data of the previous call executed to the unit (30) controlling the payment transactions during the next call executed at the terminal equipment.

11. A method for transmitting information not relating to a call to a telephone user in a cellular radio system comprising a number of terminal equipments

(20a-20c) and base stations (22a-22c) communicating over a radio path, in which method information not relating to the calls is sent from the system to the terminal equipments (20a-20c) which display the information in a display unit (35), characterized in that the display unit (35) of the terminal equipment is controlled in such a way that the display unit (35) displays alternately call-related information and information not relating to the calls.

10 12. A method as claimed in claim 11, characterized in that messages not relating to the calls are sent to the terminal equipments by means of one or more short messages.

15 13. A method as claimed in claim 11, characterized in that the same message not relating to the calls is sent to one or more terminal equipments (20a-20c).

20 14. A method as claimed in claim 11, characterized in that the display unit (35) of the terminal equipment is controlled in such a way that the information displayed in the display unit (35) is changed at given intervals.

25 15. A method as claimed in claim 14, characterized in that an indication of the desired interval after which the information displayed in the display unit (35) is changed is sent to the terminal equipments (20a-20c) by means of short messages.

30 16. A method as claimed in claim 11, characterized in that information not relating to the calls is displayed both when a call is in progress and when the telephone is in idle mode.

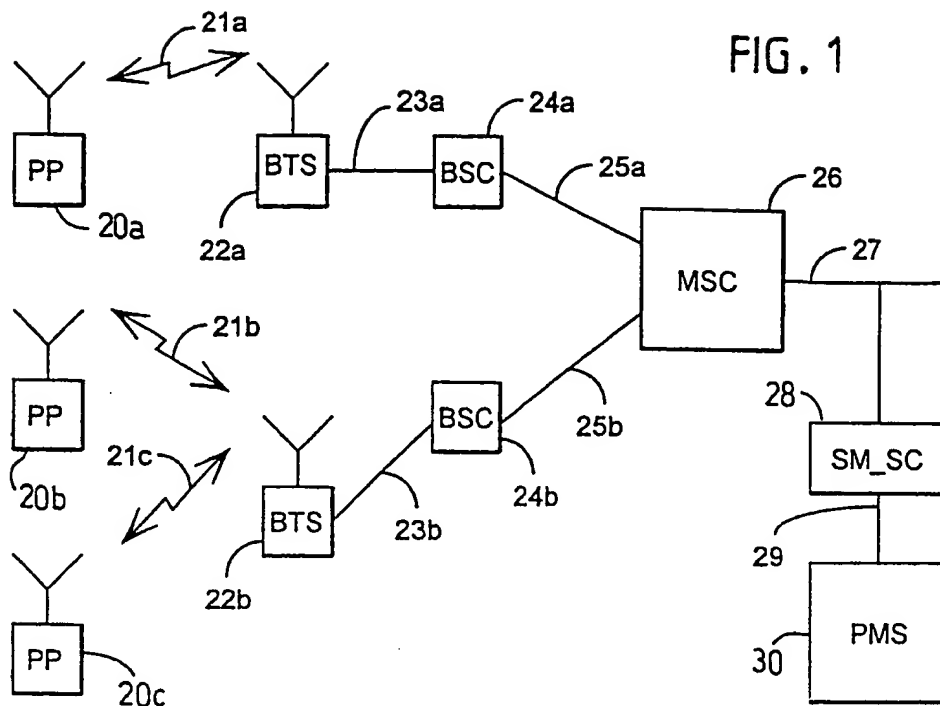
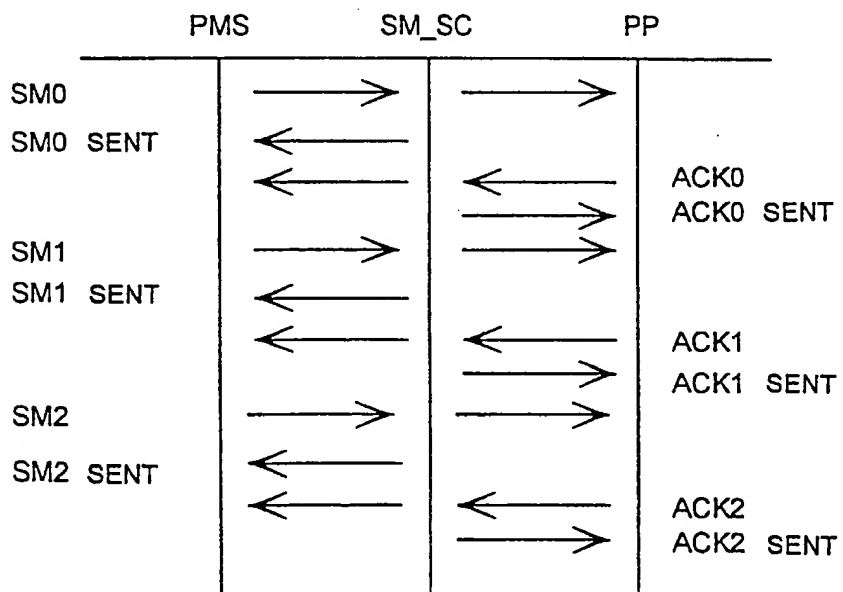


FIG. 2



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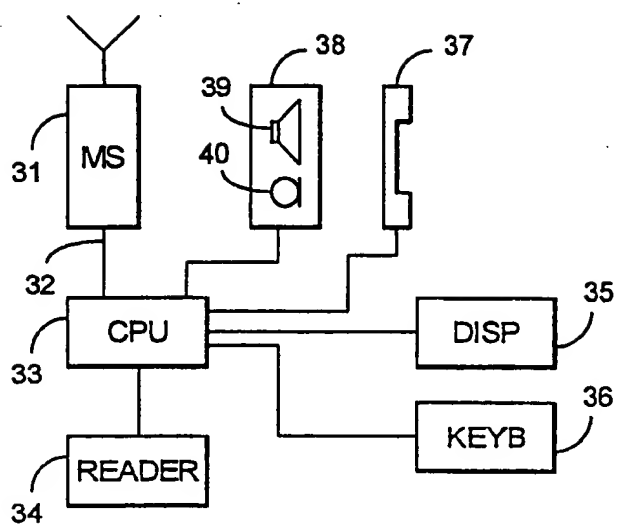


Fig. 3

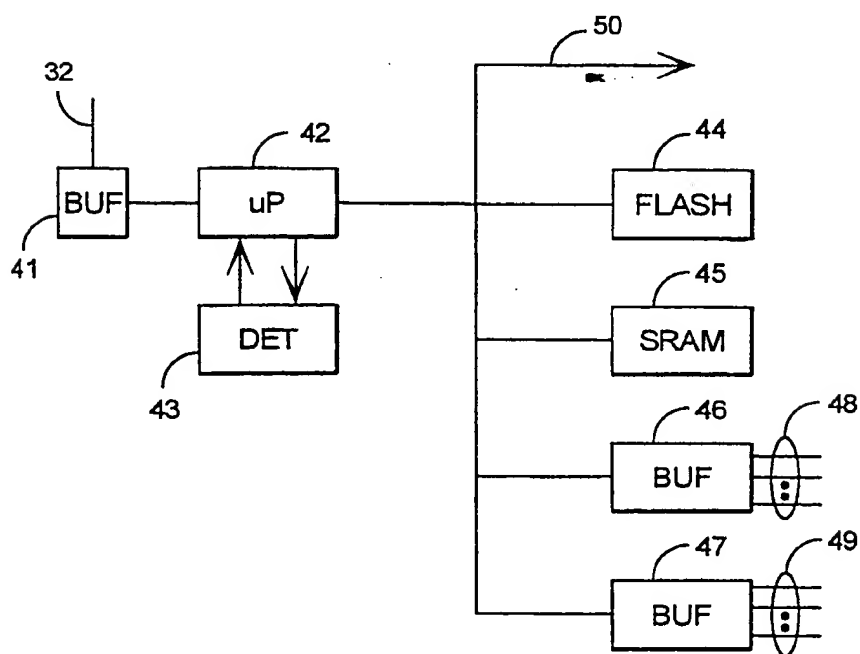


Fig. 4

1
INTERNATIONAL SEARCH REPORT

Int. application No.

PCT/FI 96/00321

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: H04Q 7/22

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	IEEE Electronics Division Colloquium, Volume, January 1991, Kevin Holley, "The GSM short message service", see page 2, 3rd piece; page 2, 5th piece and page 4 3rd piece --	1-6,9-15
Y	EP 0647055 A1 (AT&T CORP), 5 April 1995 (05.04.95), column 2, line 1 - line 21; column 3, line 31 - line 58 --	1-6,9-15
Y	GB 2272607 A (VODAFONE LIMITED), 18 May 1994 (18.05.94), page 1, line 21 - page 2, line 2; page 4, line 5 - page 7, line 20 --	1-6,9-15

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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Date of the actual completion of the international search

Date of mailing of the international search report

7 October 1996

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/ISA 96/00321

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 9214329 A1 (TELENOKIA OY), 20 August 1992 (20.08.92), page 5, line 3 - line 33; page 13, line 22 - line 29 --	1-16
P,A	EP 0690639 A2 (VAISALA OY), 3 January 1996 (03.01.96), see whole document -- -----	1-16